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for

Aeroelastic Analyses Using Various CFD Models

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Under this grant, the development of the two- and three-dimensional full potential cascade aeroelastic codes (FPCAS2D and FPCAS3D) has been completed. These codes allow flutter calculations in arbitrary phase angle modes, including effects of blade thickness and shock wave motion. The development of these two codes has required the development of the time and frequency domain flutter calculation methods, and the development of the pulse response and influence coefficient methods for computational efficiency. These advances have been documented through research reports and papers, Refs. [1-5]. A user's guide has been published for each code, Refs. [6,7].

[1]   Bakhle, M. A., Mahajan, A. J., Keith, T. G., Jr., and Stefko, G. L. "Cascade Flutter Analysis with Transient Response Aerodynamics", NASA TM-103746, 1991; also *Computers and Structures*, Vol. 41, No. 5, pp. 1073-1085, 1991.

[2]   Bakhle, M. A., Reddy, T. S. R., and Keith, T. G., Jr., "Time Domain Flutter Analysis of Cascades Using a Full-Potential Solver", *AIAA Journal*, Vol. 30, No. 1, pp. 163-170, Jan. 1992.

[3]   Bakhle, M. A., and Reddy, T. S. R., "Unsteady Aerodynamics and Flutter of Propfans Using a Three-Dimensional Full-Potential Solver", AIAA Paper 93-1633, Apr. 1993.

[4]   Bakhle, M. A., Reddy, T. S. R., and Keith, T. G., Jr., "Subsonic / Transonic Cascade Flutter Using a Full-Potential Solver", *AIAA Journal*, Vol. 31, No. 7, pp. 1347-1349, July 1993.

[5]   Bakhle, M. A., Keith, T. G., Jr., and Williams, M. H. "Unsteady Aerodynamics and Flutter Based on the Potential Equation", AIAA Paper 93-2086, July 1993.

[6]   Bakhle, M. A., "FPCAS2D User's Guide, Version 1.0", NASA CR-195413, 1994.

[7]   Bakhle, M. A., "FPCAS3D User's Guide: A Three Dimensional Full Potential Aeroelastic Program, Version 1.0", NASA CR-198367, 1995.